

MOSFETs Silicon N-Channel MOS ( $\pi$ -MOSVIII)

# TK10A80E



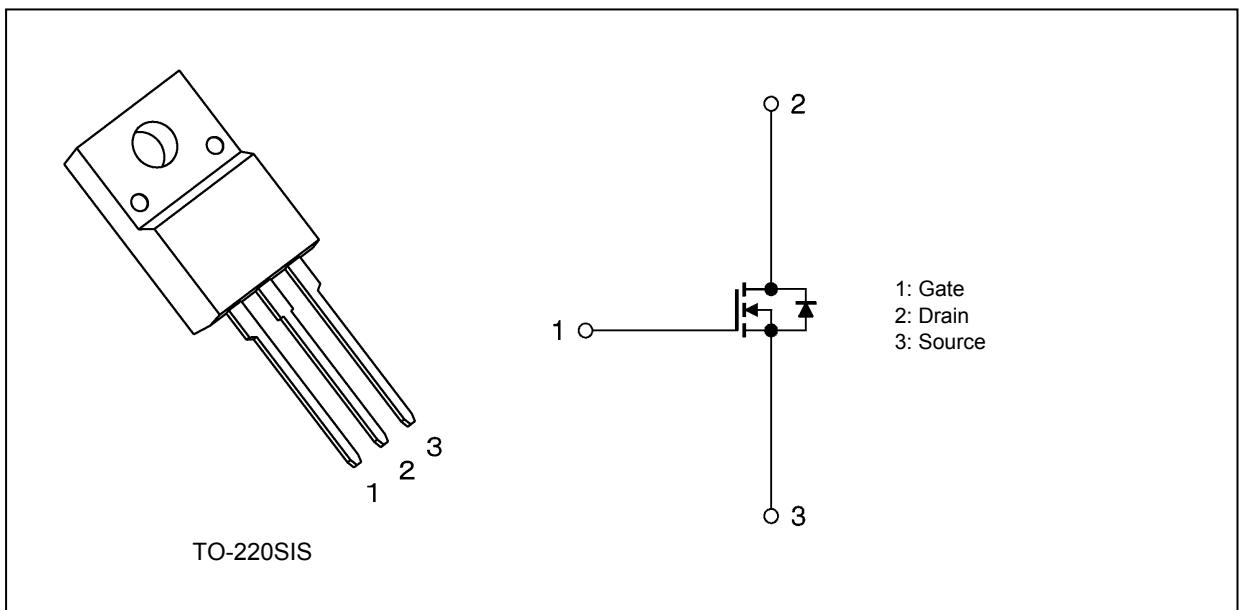
## 1. Applications

- Switching Voltage Regulators

## 2. Features

- (1) Low drain-source on-resistance:  $R_{DS(ON)} = 0.7 \Omega$  (typ.)
- (2) Low leakage current :  $I_{DSS} = 10 \mu A$  (max) ( $V_{DS} = 640 V$ )
- (3) Enhancement mode:  $V_{th} = 2.5$  to  $4.0 V$  ( $V_{DS} = 10 V$ ,  $I_D = 1 mA$ )

## 3. Packaging and Internal Circuit



#### 4. Absolute Maximum Ratings (Note) ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	800	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	
Drain current (DC)	(Note 1)	$I_D$	A
Drain current (pulsed)	(Note 1)	$I_{DP}$	
Power dissipation	( $T_c = 25^\circ\text{C}$ )	$P_D$	W
Single-pulse avalanche energy	(Note 2)	$E_{AS}$	mJ
Avalanche current	$I_{AR}$	10	A
Reverse drain current (DC)	(Note 1)	$I_{DR}$	
Reverse drain current (pulsed)	(Note 1)	$I_{DRP}$	
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to 150	
Isolation voltage (RMS)	$V_{ISO(RMS)}$	2000	V
Mounting torque	TOR	0.6	N · m

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

#### 5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance	$R_{th(ch-c)}$	2.5	$^\circ\text{C/W}$
Channel-to-ambient thermal resistance	$R_{th(ch-a)}$	62.5	$^\circ\text{C/W}$

Note 1: Ensure that the channel temperature does not exceed 150  $^\circ\text{C}$ .

Note 2:  $V_{DD} = 90$  V,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 8.3$  mH,  $R_G = 25 \Omega$ ,  $I_{AR} = 10$  A

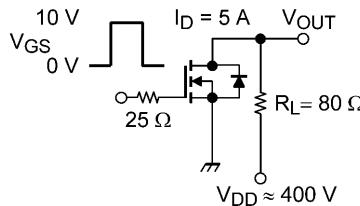
## 6. Electrical Characteristics

### 6.1. Static Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 30\text{ V}$ , $V_{DS} = 0\text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
Drain cut-off current	$I_{DSS}$	$V_{DS} = 640\text{ V}$ , $V_{GS} = 0\text{ V}$	—	—	10	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 10\text{ mA}$ , $V_{GS} = 0\text{ V}$	800	—	—	$\text{V}$
Gate threshold voltage	$V_{th}$	$V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$	2.5	—	4.0	
Drain-source on-resistance	$R_{DS(\text{ON})}$	$V_{GS} = 10\text{ V}$ , $I_D = 5\text{ A}$	—	0.7	1.0	$\Omega$

### 6.2. Dynamic Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	$C_{iss}$	$V_{DS} = 25\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$	—	2000	—	$\text{pF}$
Reverse transfer capacitance	$C_{rss}$		—	15	—	
Output capacitance	$C_{oss}$		—	150	—	
Gate resistance	$r_g$	$V_{DS} = \text{OPEN}$ , $f = 1\text{ MHz}$	—	3.5	—	$\Omega$
Switching time (rise time)	$t_r$	See Fig. 6.2.1.	—	40	—	$\text{ns}$
Switching time (turn-on time)	$t_{on}$		—	80	—	
Switching time (fall time)	$t_f$		—	35	—	
Switching time (turn-off time)	$t_{off}$		—	140	—	
MOSFET dv/dt ruggedness	$dv/dt$	$V_{DD} = 0$ to $400\text{ V}$ , $I_D = 10\text{ A}$	20	—	—	$\text{V/ns}$



Duty  $\leq 1\%$ ,  $t_w = 10\text{ }\mu\text{s}$

Fig. 6.2.1 Switching Time Test Circuit

### 6.3. Gate Charge Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx 400\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 10\text{ A}$	—	46	—	$\text{nC}$
Gate-source charge 1	$Q_{gs1}$		—	13	—	
Gate-drain charge	$Q_{gd}$		—	18	—	

### 6.4. Source-Drain Characteristics ( $T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage	$V_{DSF}$	$I_{DR} = 10\text{ A}$ , $V_{GS} = 0\text{ V}$	—	—	-1.7	$\text{V}$
Reverse recovery time	$t_{rr}$	$I_{DR} = 10\text{ A}$ , $V_{GS} = 0\text{ V}$	—	1200	—	$\text{ns}$
Reverse recovery charge	$Q_{rr}$	$-dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	12	—	$\mu\text{C}$
Peak reverse recovery current	$I_{rr}$		—	24	—	$\text{A}$